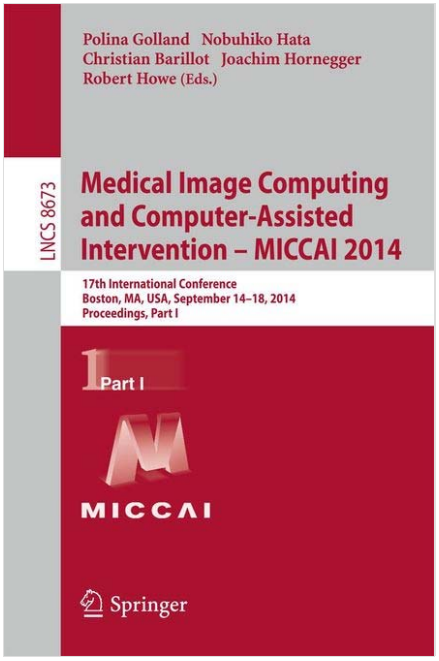
Candidate sampling for neuron reconstruction from anisotropic electron microscopy volumes

Funke, Jan ; Martel, Julien N P ; Gerhard, Stephan ; Ciresan, Dan C ; Giusti, Alessandro ; Gambardella, Luca M ; Schmidhuber, Jürgen ; Pfister, Hanspeter ; Cardona, Albert ; Cook, Matthew

Abstract: The automatic reconstruction of neurons from stacks of electron microscopy sections is an important computer vision problem in neuroscience. Recent advances are based on a two step approach: First, a set of possible 2D neuron candidates is generated for each section independently based on membrane predictions of a local classifier. Second, the candidates of all sections of the stack are fed to a neuron tracker that selects and connects them in 3D to yield a reconstruction. The accuracy of the result is currently limited by the quality of the generated candidates. In this paper, we propose to replace the heuristic set of candidates used in previous methods with samples drawn from a conditional random field (CRF) that is trained to label sections of neural tissue. We show on a stack of Drosophila melanogaster neural tissue that neuron candidates generated with our method produce 30% less reconstruction errors than current candidate generation methods. Two properties of our CRF are crucial for the accuracy and applicability of our method: (1) The CRF models the orientation of membranes to produce more plausible neuron candidates. (2) The interactions in the CRF are restricted to form a bipartite graph, which allows a great sampling speed-up without loss of accuracy.

DOI: https://doi.org/10.1007/978-3-319-10404-1_3



MEDICAL IMAGE COMPUTI AND COMPUTE ASSISTED INTERVEN - MICCAI 2014 - 2014

ABOUT

EDITORS

DOI

ISBN

CONFEREN

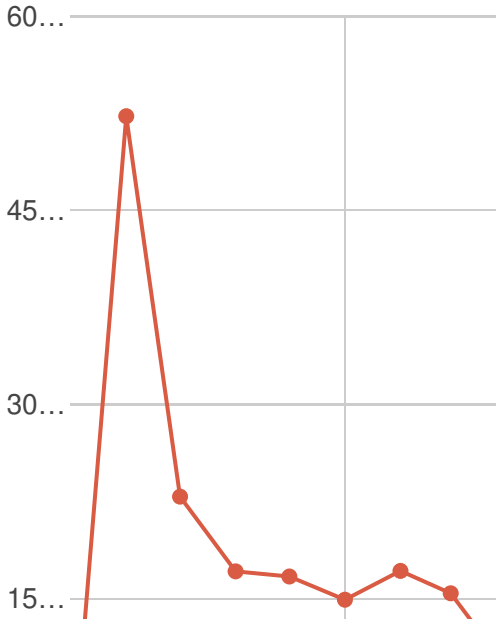
ALL ACTIVITY FOR BOOK:

Medical Image Computing and Computer-Assisted Intervention – MICCAI 2014

CITATION	MENTION	READERS	DOWNLO	REVII
11(	5	2k	18(	0

SPRINGERLINK DOWNLOAD SUMMARY

The combined chapter downloads for this book are **180,022**.



SHOW ACTIVITY FOR:

SUMMARY
110
5
2K
180K
0
Combined